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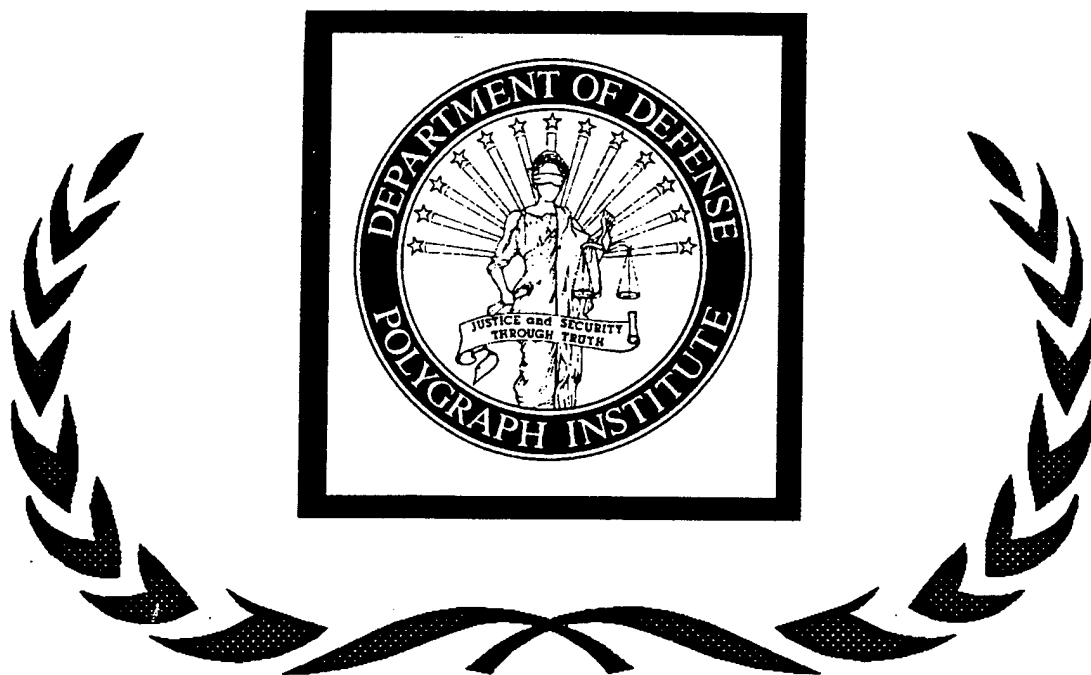
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**A Comparison of Accuracy Rates Between Detection
of Deception Examinations Using the Polygraph and the
Computer Voice Stress Analyzer in A Mock Crime Scenario**

Victor L. Cestaro, Ph.D.

August 1996

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Report No. DoDPI95-R-0004

A Comparison of Accuracy Rates Between Detection of Deception Examinations Using the
Polygraph and the Computer Voice Stress Analyzer in a Mock Crime Scenario

Victor L. Cestaro, Ph.D.

November 1996

Department of Defense Polygraph Institute
Fort McClellan, Alabama 36205

Director's Foreword

Over the last twenty years it has been proposed, several times, that changes in human voice characteristics are indicative of deception. Several manufacturers have, over this period, marketed instruments purported to detect deception through analysis of human voice responses. Claims that the human voice response can be used to detect deception have, in the past, not been strongly supported in the research literature.

A relatively new device, the Computerized Voice Stress Analyzer (CVSA), has been marketed by the National Institute for Truth Verification. The CVSA has become increasingly popular, possibly because it is relatively easy to operate and operator training requires a minimal 40 hours of course work. Proponents of the instrument claim relatively high deception detection accuracy rates when the CVSA is used as taught by the National Institute for Truth Verification. These claims are, however, based primarily on anecdotal evidence rather than evidence obtained through rigorous systematic study.

This report describes one of the more scientific studies conducted using the CVSA instrument to date. The study was designed to compare the validity of data collected using a traditional polygraph instrument to that collected using the CVSA. It is the second in a series of studies being conducted at the Department of Defense Polygraph Institute. Those reviewing this study should remember that the results of one or two studies are rarely considered to be conclusive.

A handwritten signature in black ink, appearing to read "Michael H. Capps". The signature is fluid and cursive, with the first name "Michael" being more prominent.

Michael H. Capps
Director

Acknowledgments

The author wishes to express thanks to the people and volunteer subjects who participated in this research. Special thanks to: Jeff St. Cyr, CW4 Charles Slupski, and Sandra McGath who assisted with subject handling and other duties throughout the study; SA Bob Tippet of the Florida Department of Law Enforcement and Lt. R. Kelly Vaughan of the Martin County (Florida) Sheriff's Office for conducting the Computer Voice Stress Analyzer (CVSA) examinations; Investigator Harold Enders of the Hernando County (Florida) Sheriff's Office, Investigator Brett Meade of the Orange County (Florida) Sheriff's Office, and Detective Robert Fedi of the Altamonte Springs (Florida) Police Department for blind-scoring the CVSA charts; SA Domingo Hernandez of the U.S. Secret Service, and SA Charles Ruff of U.S. Army Military Intelligence for conducting the polygraph examinations; and U.S. Department of Defense Polygraph Institute instructors CW4 Madison L. Mumbauer, CW3 Laura Campbell, and Earl Taylor for blind scoring the polygraph charts. This project was funded by the Department of Defense Polygraph Institute as DoDPI95-P-0005. The views expressed in this article are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

Abstract

CESTARO, V. L. A comparison of accuracy rates between detection of deception examinations using the polygraph and the computer voice stress analyzer in a mock crime scenario. November 1996, Report No. DoDPI95-R-0004. Department of Defense Polygraph Institute, Ft. McClellan, AL 36205.--The accuracy and consensus of decisions rendered between examinations administered using the traditional polygraph instrument and the Computer Voice Stress Analyzer (CVSA) were examined. One hundred twenty subjects were given detection of deception examinations either on the polygraph instrument or the CVSA. Subjects were divided into two groups, with one group participating in a mock theft and instructed to be deceptive about their participation in that crime. The remaining group was told that a crime had been committed, but they did not participate in any way. This group was instructed to be truthful about not being involved in the theft. Half of each group of subjects were tested in a Psychophysiological Detection of Deception (PDD) examination using the polygraph instrument and the remaining half were tested using the CVSA instrument. Groups were counterbalanced for gender. Six blind scorers, three trained in polygraph use and three trained in use of the CVSA, independently rendered decisions for subjects' examinations. Neither group of blind scorers achieved overall accuracy rates better than chance levels. A significant interrater agreement among the three blind examiners within each instrument type was found using the kappa statistic for multiple raters ($p < .05$).

Key-words: voice stress, CVSA, PDD, DLCT, directed lie control, interrater agreement, jeopardy

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Previous research, in which accuracy and agreement were examined between decisions rendered, using psychophysiological detection of deception (PDD) instruments and procedures, and the computer voice stress analyzer (CVSA), showed that although the decisions made using PDD were more accurate than those made using the CVSA (62.5% vs. 38.7%), blind-scoring examiners obtained independent decision concurrence rates significantly greater than chance expectancy (Cestaro, 1996). All subjects were tested in a low stress situation in which half were being deceptive about a number selected prior to the examination. Concurrence was determined by examiners' congruent choice of a key number selected by subjects prior to a numbers acquaintance test, whether the choice was correct or not.

The current study compared the accuracy of decisions rendered using a standard field polygraph instrument and the CVSA in a situation where subjects programmed guilty may have had a perception of involvement in criminal activity, and were told to be deceptive about their involvement. Since the CVSA zone tests normally employ directed lie control questions, a directed lie control/single test interview (DLC/STI) format was employed for the PDD examinations to maintain similarity between the two procedures. This test format is currently used in the Test for Espionage and Sabotage (TES) taught at the Department of Defense Polygraph Institute (DoDPI), and was adapted for use in criminal applications as the Directed Lie Specific Issue Test (DLSI) described by Gaines (1995). The DLSI test used in this study was not a proven test for field use. However, previous research has shown that the replacement of one standard control question with a directed lie control question reduced the number of false positive and inconclusive determinations (Honts & Raskin, 1988).

A Zone of Comparison test (ZOC) as taught by the National Institute for Truth Verification (NITV) was used for the CVSA examinations. Commonly accepted pre-test, in-test, and post-test procedures were employed for both testing procedures. Examiners were not informed as to the innocence or guilt of each subject. Each examiner scored his own tests. Three additional PDD examiners and three additional CVSA examiners blind scored the tests. All decisions, including incorrect determinations, were checked for concurrence. Accuracy was determined by the frequency of correct determinations made regarding the guilt or innocence of subjects. Concurrence rates for congruent decisions were used to determine whether each of the two instruments responds reliably to autonomic nervous system activity. This study was conducted to determine if both instruments are equivalent for detecting response changes when there may be a perception, by subjects, of involvement or jeopardy. In order to provide an incentive for subjects to pass the examinations (and to raise the level of jeopardy), they received a \$50 bonus if they were able to convince the examiner that they were innocent, irrespective of programming. Guilty subjects who were correctly identified by the examiner had to return the \$50 (taken during the commission of a mock theft) to the examiner. Innocent subjects who did not pass the examination did not receive the cash bonus.

Method

Subjects

One hundred twenty subjects recruited from a contract agency were randomly assigned to each of four groups. Subjects were 60 males and 60 females between the ages of 19 and 65 years, in good health, who had not previously participated in a PDD examination.

Apparatus

Two standard field polygraph instruments (Lafayette , Lafayette, IN, Factfinder Model 76740/76741) were used to record skin resistance, respiratory, and cardiovascular activity on paper charts. Two Computer Voice Stress Analyzers (NITV, West Palm Beach, FL) were used to record and display voice response data on paper charts. Lapel microphones (Radio Shack, Fort Worth, TX, Model 33-3003) were used for transducing verbal responses to the CVSA microphone input. Two voice recorders (TEAC, Montebello, CA, Model 134B) were used to collect voice responses for off-line analysis. A lavalier microphone (Shure, Evanston, IL, Model 570S) was used with each of the audio recorders to record subjects' verbal responses.

Examiners

Two certified PDD examiners, trained at the Department of Defense Polygraph Institute conducted the PDD portion of the study. Two additional certified PDD examiners, also trained by the NITV and experienced in CVSA use, conducted the CVSA portion of the study. Three additional certified PDD examiners blind-scored the polygraph tests. The CVSA tests were also blind-scored by three additional examiners, trained and certified in CVSA methods.

Procedures

Upon arrival at the research site, each participant was escorted by a research team assistant to a secluded briefing room and asked to read a brief description of the research project (Appendix A). Individuals indicating that they would participate were asked to read and sign an informed consent affidavit (Appendix B). Any questions were answered. A brief biographical/medical questionnaire was completed, to ensure that the participant was in good health and not currently taking medication which could interfere with the PDD examination results (Appendix C). Subjects assigned to the mock crime scenario (Appendix D) were appropriately instructed by the scenario setter (Appendix E). The same scenario was used for all subjects programmed guilty (both instruments). These subjects were informed that the examiner had left \$50 of his own money in a wallet in a jacket pocket inside a locked wall locker with the examiner's name on the locker door. The subject was given a key ring with several keys on it, and written instructions for locating the room with the wall locker. The subject had to locate the room, the locker, and the correct key to open the wall locker. After taking the money from the wallet, the subject was required to hide the \$50 on his or her person before returning to the waiting room. The subject had to show the money to a research assistant who was standing by in the waiting room to confirm the "theft" of the money. The subject was then given an envelope containing a card on which the subject's programming condition was written, and escorted to the examination room.

Subjects programmed innocent were informed that a particular type of crime had been committed but that they were not involved in any way (Appendix F). Subject assignment procedures insured that male/female group assignments were evenly distributed across programming (guilty/innocent) and instruments (polygraph/CVSA). In order to increase the perception of personal jeopardy (loss of money), subjects who were programmed guilty were told that they would be allowed to keep the \$50 which they took during the commission of the mock crime, if the examiner determined from his tests that the subject was innocent of the "crime." However, if the examiner obtained a true positive result, the subject had to return the \$50 to the examiner. Innocent subjects who were determined to be innocent were given a \$50 bonus, and were informed so during briefing prior to the examination.

PDD procedure. The examiner conducted the pre-test interview, as described in Appendices G and H, and placed the sensors on the subject just prior to the acquaintance test. The acquaintance test was administered using a Known Solution Peak of Tension Numbers Test to familiarize the subject with the operation of the polygraph. After discussion of the case facts and question review, the actual examination employed the DLSI test, using only the control and irrelevant questions shown in Appendices I and J. The examiner administered the test twice in an attempt to clear any inconclusive (INC) results. Guilty subjects who were determined to be deceptive had to return the \$50 to the examiner. The examiner was responsible for conducting the entire examination in the order described by the DLSI Test Outline (Appendix K).

CVSA procedure. The examiner conducted the pre-test interview (Appendix L) in a manner that removed any situational stress associated with detection of deception examinations, and reviewed the test questions with the subject. The lavalier and lapel microphones were then placed on the subject and the CVSA instrument was calibrated for the subject's voice level. The examination then proceeded using the accepted CVSA format for the ZOC test, using the questions shown in Appendix M. Guilty subjects who were determined to be deceptive were required to return the \$50 to the examiner.

The CVSA examiner conducted two examinations. The charts from the first examination were discarded to avoid scoring tests confounded by situational stress. This is standard operating procedure for CVSA examinations (NITV Certified Examiners Course, 1993, p. 26). The reason for discarding the charts was explained to the subject. The second chart was retained for scoring. All examinations were recorded on audio tape for off-line analysis to confirm the "live" results.

When the examination (PDD or CVSA) was completed, the subject was escorted back to the briefing room for subject debriefing (Appendix N).

Scoring procedures

Prior to data reduction and analysis, the PDD examination tests were scored by the administering examiners, and were also blind-scored by the three additional certified PDD examiners. CVSA tests were also scored by the administering examiners and blind-scored by three certified CVSA examiners selected by the CVSA examiners who administered the

examinations. All blind-scoring examiners are hereinafter referred to as evaluators. All charts were marked only with the date of the examination, the subject number, and where applicable, event (stim) markers for the responses, and question type and number (e.g., R1 for Relevant 1, C2 for Control 2). The examiners' decisions, response scores, and overall scores were not written on the charts. Decisions were either Deception Indicated (DI), No Deception Indicated (NDI), or INC. If a test was administered a second time for any reason, the test number was placed in the upper left hand corner of the chart. Decisions for each subject were entered on a separate table by each examiner, prior to opening the envelope carried by the subject. The envelope contained a 3" x 5" card with the subject number and programming (guilty/innocent) written on the card. If the examiner obtained a true positive, the subject was required to return the \$50 to him at this time.

Data reduction

The dependent measures were the number of correct determinations made regarding deception and non-deception, and the number of concurrent determinations made within each instrument category. Concurrence was determined by comparing the decision made for each subject among all scoring examiners within an instrument category, irrespective of the accuracy of the decision. Separate accuracy rates for PDD examinations were determined by inclusion and exclusion of INC determinations. CVSA procedures do not allow for INC determinations.

Data analysis

Accuracy was assessed by tests of proportion differences between obtained accuracy and accuracy expected by chance alone (.50). A power analysis conducted prior to data collection indicated that with $N = 120$ (60 per group collapsed across programming [guilty, innocent]), power = .89 ($p = .05$) using an expected effect size of 0.20. Scoring reliability for the evaluators (in the form of interrater agreement) was assessed by the kappa statistic for multiple raters (Fleiss, 1981).

Results

Evaluator accuracy

When INC decisions were included, the PDD evaluators obtained an overall accuracy rate of 48.3%; 71.1% for NDI decisions, and 25.6% for DI decisions. When INC decisions were not included, accuracy increased to 57.2% overall; 81% for NDI, and 31.5% for DI decisions. CVSA evaluators obtained an overall accuracy rate of 52.2 %, with 46.7% correct NDI decisions and 57.7% correct DI decisions. Neither of the overall accuracy rates were significantly better than chance levels (50%), nor did any individual evaluator obtain a combined (DI/NDI) accuracy rate better than chance. No effects were found for gender. Signal detection methods (SDT) were applied to the data as shown in Table 1, indicating low sensitivity for both instruments and procedures.

Table 1
Sensitivity of PDD and CVSA Instruments and Procedures
Measured Using Signal Detection Theory (SDT)

Type of instrument	Criteria and sensitivity		
	beta	d'	p(d')
Polygraph	1.299	.38	.35
CVSA	.982	.12	.45

Note: PDD = psychophysiological detection of deception; CVSA = computer voice stress analyzer

Administering examiner accuracy

Neither the CVSA nor the PDD examiners who administered the tests obtained overall accuracy rates better than chance. PDD examiners obtained 73.3% correct NDI decisions and 33.3% correct DI decisions, for an overall accuracy of 53.3%. Neither examiner made an INC decision. The CVSA administering examiners obtained 33.3% correct NDI decisions and 66.7% correct DI decisions, achieving an overall accuracy of 50%.

Interrater reliability

The PDD evaluators agreed unanimously on 60% of the decisions, whether those decisions were correct or incorrect. The obtained mean proportion of agreement was .74, where the estimated value by chance was .47. Using Fleiss' (1981) method for evaluating agreement among multiple raters, $\kappa = .51$, with an estimated variance = .003 (corrected $\underline{z} = 9.28$, $p < .05$). The CVSA evaluators obtained unanimous consensus on 52% of the cases, correct or incorrect. Their obtained mean proportion of agreement was .69, where chance = .51; $\kappa = .37$ with an estimated variance = .006 (corrected $\underline{z} = 5.05$, $p < .05$). Evaluators for both instruments and associated procedures agreed at rates significantly greater than chance levels. Although there were differences in the proportions of agreement between the two instrument types (largely due to the fact that PDD evaluators had three decision options vs. the two decision options of the CVSA evaluators), there was no significant difference between the two groups. Since kappas are approximately normally distributed with the variances above and are independent, the difference between them would be normally distributed with a variance equal to the sum of the two variances. Converting to \underline{z} using the combined variance yielded a value of 1.24, $p > .05$.

Discussion

The data analyses indicate that within the test paradigm used in this study, neither the PDD nor the CVSA test chart evaluators were able to reliably differentiate between truthful responses and deception at levels greater than chance. The power analysis conducted prior to this experiment indicated that the design had a .89 probability of correctly detecting an effect of at least .20 if that effect actually exists. The failure to obtain accuracy rates better than chance indicates that there is a .89 probability that neither instrument was sensitive enough, under the test conditions used, to detect effects of at least .20 greater than chance accuracy. However, the high rate of agreement among examiners for each instrument type was consistent with previous findings (Cestaro, 1996), lending additional support to the suggestion that

accuracy rates are more a function of instrument/procedure sensitivity rather than examiner data evaluation skills.

As stated in a previous study (Cestaro, 1996), low levels of jeopardy perceived by subjects may have contributed to the obtained low accuracy rates for both instruments. In this study, the directed lie control questions may have influenced the differential effects observed between the two instruments and processes. Raskin and Hare (1988) have shown that the inclusion of a directed lie control in a polygraph examination reduces the numbers of inconclusive and false positive decisions. CVSA evaluators obtained higher frequencies of correct DI decisions (57.7%) than did the PDD evaluators (25.6%) and lower frequencies of correct NDI decisions (46.7% vs. 71.1%). This criterion shift was evident when the data were examined using signal detection theory methods. PDD evaluators tended to be conservative in their judgments--as shown by a right shifted criterion (β)--while their CVSA counterparts were liberal in judgments of deception indicated. Both instruments displayed low sensitivity when the data were analyzed using SDT ($p = .35$ and $p = .45$ respectively for the PDD and CVSA). Further research is needed to design analog (laboratory) models in which treatment effect sizes are large enough and reliable enough to predict PDD instrument and process performance consistently. Because there are no reliable benchmarks against which to measure the performance of new instruments and procedures, it is difficult to generalize laboratory findings to the field. Additionally, there is little scientific evidence to support the theory of operation and validity of voice stress analyzers, making evaluation of the CVSA difficult at best.

References

- Cestaro, V. L. (1996). A comparison between decision accuracy rates obtained using the polygraph instrument and the computer voice stress analyzer in the absence of jeopardy. Polygraph, 25, 117-127.
- Fleiss, J. L. (1981). Statistical methods for rates and proportions (2nd ed.). New York: John Wiley & Sons.
- Gaines, K. H. (1995). Laboratory study of the directed lie specific issue test. Unpublished manuscript.
- Honts, C. R., Raskin, D. C. (1988). A field study of the validity of the directed lie control question. Journal of Police Science and Administration, 16, 56-61.

Appendix A

Description of Research

WELCOME: Welcome to the Department of Defense Polygraph Institute. This may be the first time you have been to the Institute so we would like to provide you with some information concerning your visit today. PLEASE REMEMBER that your participation is entirely voluntary - you are free to leave at any time. If you have any questions, please feel free to ask the individuals assisting you.

RESEARCH TITLE: A Comparison of Accuracy Rates Between Detection of Deception Examinations using the Polygraph and the Computer Voice Stress Analyzer in a Mock Crime Scenario.

PRINCIPAL INVESTIGATOR: Dr. Victor L. Cestaro, DoDPI Research Psychologist.

BACKGROUND / SIGNIFICANCE: The Psychophysiological Detection of Deception (PDD) is a process believed to determine whether an individual is responding truthfully to a series of questions. PDD is commonly called "lie detection" or "polygraph" test. The process is based on the assumption that an individual who is deceptive (i.e., lying) has a greater response in some body systems than a person who is not. It is also proposed that there are certain characteristics in a person's voice that change when that person is being deceptive. The purpose of this research is to determine how well deception can be detected by voice characteristics when compared with the results of the polygraph instrument.

YOU SHOULD NOT PARTICIPATE IN THIS STUDY IF YOU:

- (1) Are taking certain prescription medications (Valium, beta-blockers, etc.).
- (2) Have a history of dizziness or fainting spells.
- (3) Have been diagnosed with a heart condition.
- (4) Have been diagnosed with high blood pressure.
- (5) Have been diagnosed with a respiratory ailment, especially asthma or emphysema.
- (6) Currently suffer from an acute health problem such as a cold, active allergy problem, hemorrhoidal problem.

PROCEDURES: During this project you will be asked to participate in a research session lasting approximately 2 hours. Before the session begins, you may be asked to participate in a simulated crime. During the examination session you will be asked details about the "crime" you may have committed. If you have participated in the "crime", you are not to answer truthfully about your participation to the examiner during the examination. YOUR TASK IS TO LIE SUCCESSFULLY, to the examiner concerning your part in the "crime". If you have not participated in the commission of the "crime", you are to answer questions truthfully, since you are not guilty and have nothing to hide from the examiner. Some people will participate in a polygraph detection of deception (PDD) examination, and others will participate in a computer voice stress analysis (CVSA) examination.

Participation in the PDD and CVSA processes is relatively simple. The examiner will ask several questions concerning your age, health, and normal daily activities. He will then briefly explain the theory of the Psychophysiological Detection of Deception or the CVSA and review the questions he will ask during the examination with you. With your permission, the examiner will then attach sensors to your body before the polygraph examination begins. Two small flat metal sensors will be attached to the first and third fingers of one hand. Expandable tubes will be put around your upper and lower chest. A blood pressure cuff will be wrapped around your arm. You will be asked to sit still for several minutes while the examiner asks the questions he reviewed earlier. When the session is complete, you will be escorted to another room for debriefing. The CVSA session will be like the PDD examination except that no sensors will be attached to your body. Instead, a small microphone will be placed on your chest and held in place with a cord.

DISCOMFORTS: Some people find it difficult to sit still for several minutes at a time during the PDD test while physiological reactions are recorded. Part of the PDD process requires the wearing of an inflated blood pressure cuff, which some people find moderately uncomfortable. The examiner is sensitive to this discomfort and will attempt to make the process as brief as possible. The actual test lasts approximately 5 minutes and consists of three repetitions of the questions. If you are assigned to the CVSA examination, the test consists of two repetitions of the questions. The total length of time that you will actually be participating in this study is approximately two hours, however, you may be here for 3 or 4 hours.

VIDEOTAPING: All examinations conducted during this project will be videotaped using wall and ceiling mounted video cameras and commercial videotape recorders. The tapes collected will be maintained until the operational and data analysis portions of the project are complete. At that time the video tapes will be erased and made available for re-use by the research and instruction divisions.

RISKS: There are no known risks involved in this study.

CONFIDENTIALITY OF RECORDS: You will not be asked any personal questions by the examiner, except medically related information necessary for this study. Neither your identity nor any information you reveal during this project will be released to anyone not directly involved in the research. Members of the U.S. Army Surgeon General's Human Subjects Research Review Board may inspect the research records in their capacity as reviewing officials.

YOUR RIGHTS: You have the right to ask any questions about any aspect of your participation in the study. If any problems arise at any time in conjunction with your involvement in the study, or if you have been injured in any way as a result of the study, the person to contact is the Director, Department of Defense Polygraph Institute. In the event that you do have questions or any of the above has occurred please contact Dr. William Yankee at (205) 848-3803. Should any question arise concerning study-related injury, you may contact

the Commander of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, telephone number (205) 848-2200.

VOLUNTARY PARTICIPATION: Your participation in this study is completely voluntary.

If you would prefer not to participate, do not volunteer for it! Even if you decide to participate in the study, you may discontinue at any time without penalty or loss of benefits to which you are entitled. Should you decide not to participate, please inform someone on the staff at the Department of Defense Polygraph Institute, or if it occurs during the polygraph examination itself, inform the examiner and you will be released without censure.

ADDITIONAL COMMENTS: It is VERY IMPORTANT that you do not discuss your experiences in the PDD examination with your fellow research participants. If that occurs, you will be withdrawn from the study without further benefit.

Appendix B

Informed Consent Affidavit

This form is affected by the Privacy Act of 1974.

1. **AUTHORITY:** 10 USC 3013, 44 USC 3101 and 10 USC 1071-1087 and E.O. 9397.
 2. **PRINCIPLE PURPOSE:** To document voluntary participation in the Clinical Investigation and Research Program.
 3. **ROUTINE USES:** The SSN and home address will be used for identification and locating purposes. Information derived from the study will be used to document the study, adjudication of claims, and for mandatory record keeping associated with human use in government research. Information may be furnished to Federal agencies.
 4. **DISCLOSURE:** Voluntary. Failure to furnish requested information will preclude your voluntary participation in this investigational study.
-

PERSONAL STATEMENT

I, _____, being at least 19 years old, do hereby volunteer to participate in a research study titled "A Comparison of Accuracy Rates Between Detection of Deception Examinations Using the Polygraph and the Computer Voice Stress Analyzer in a Mock Crime Scenario" being conducted by the Department of Defense Polygraph Institute, under the direction of Victor L. Cestaro, Ph.D.

1. _____ I understand that I am participating in a research study to examine several measures and techniques, some of which are currently employed in criminal and/or security screening situations where the Psychophysiological Detection of Deception (PDD) is used. PDD is commonly called a "polygraph test" or "lie detector". If I do not participate in the PDD portion of this study, my voice will be analyzed with a Computer Voice Stress Analyzer.

2. To the best of my knowledge,

A. _____ I am not taking any prescription medication.

B. _____ I have no history of dizziness or fainting spells.

C. _____ I have not been diagnosed as having, nor do I believe that I may have any of the following:

- (1) Heart condition.
- (2) High blood pressure.
- (3) Any respiratory ailment, especially asthma or emphysema.

D. _____ I do not now have any acute health problems such as a cold, an active allergy problem, and an active hemorrhoidal problem.

3. _____ I am aware that I will be spending approximately three 3 to 4 hours at the DoD Polygraph Institute examination site on one occasion, and that I may be asked to conceal specific information from a trained Forensic Psychophysiolgogist.

4. _____ I understand that as a part of this study I may be participating in a PDD or CVSA examination during which I will be asked to sit still for several minutes at a time while physiological measurements are recorded from my body.

5. _____ I understand that there are no known dangers or risks associated with my participation in this study.

6. _____ I understand that if I am assigned to the PDD examination I will be required to wear an inflated blood pressure cuff, which some people find moderately uncomfortable.

7. _____ I understand that I will be videotaped during the examinations and that the videotape will be maintained until data analyses are complete.

8. _____ I understand that I may terminate my involvement in this study at any time and for any reason, without censure.

9. _____ I understand that my participation in this project will be terminated if I discuss the details of my participation with anyone except project supervisory personnel. NOTE: Discussion of details with other participants would invalidate the data collection.

10. _____ I understand that I should contact the principal investigator, Dr. Victor L. Cestaro, and / or the DoD Polygraph Institute Director, Dr. William Yankee [Tel: (205) 848-3803] if I have any concerns or complaints regarding this study.

11. _____ I understand that any questions concerning my rights relating to study-related injury should be directed to Colonel Weisser, MD, Commander of the Noble Army Community Hospital, Fort McClellan, Alabama, 36205, tel (205) 848-2200.

12. _____ I have been given a thorough explanation of the nature, purpose, methods, and duration of my participation in this investigation. I have been given the opportunity to ask any questions I have concerning the investigation and all questions have been answered to my full satisfaction.

Participant Signature

Witness Signature

Printed Name

Printed Name

Social Security Number

Street Address

City, State, ZIP Code

Date

Date

Appendix C

Pre-Test Questionnaire

Date of completion: _____

Please carefully complete all of the blanks below:

Name (Please Print): _____ Gender: ()M ()F

Occupation: _____ Age: _____

Hours of sleep last night: _____

Previous PDD Examination: ()Yes ()No

Have you ingested alcohol, nicotine, or caffeine (including coffee, tea, soft- drinks, and chocolate) within the last 24 hours? ()Yes ()No

If so, what and when? _____

How would you describe your present health and physical well being?

()Excellent ()Good ()Fair ()Poor

Are you presently under a physician's care and are you taking any medication?

()Yes ()No

If so, for what condition? _____

Please identify the type, dosage, and last time any medication was taken:

Are you experiencing any pain or discomfort today?

()None ()Mild ()Moderate ()Severe

Reason for any pain or discomfort today _____

Appendix D

Mock Crime Scenario

(This scenario has been used previously in a DoDPI study by Gaines.)

The subjects assigned to the guilty condition, will be programmed individually.

The experimenter will inform each programmed guilty subject that DoDPI is conducting PDD research and that the subject will be asked to participate in the taking of some money. The subject will then be told in an effort to make the scenario meaningful to the examiner, that the subject will in fact be stealing the examiner's money and then taking a PDD or CVSA test by that examiner to see if the examiner can "catch them" in the theft. The examiners are so convinced that they will be able to tell when somebody is lying to them, that they have agreed to put their "money where their mouth is." The subjects will then be told that each examiner has left \$50 of his own money in his wallet, in a wall locker marked with his name. The wall locker is locked with a key lock, which is in a locked room. The subject will be told that if he steals the money and the examiner cannot determine from the PDD or CVSA test that the subject has taken the money, the subject gets to keep the examiner's \$50. If the examiner can determine that the subject did in fact steal the money, then the subject must return the \$50 to the examiner. The experimenter will reinforce the fact that the \$50 belongs to the examiner, but that since the examiner believes he has never been in error, he is convinced that he is not going to lose any of his money.

The guilty subject will be given a key ring with several keys on it. The subject must find the correct key for the door, open the door, then find the correct key for the locker and open it. The subject must then remove the \$50 from the wallet, place the money somewhere on his/her person, lock the locker and the room door, and then return to the waiting room. The programmer, who has been standing by in the waiting room, will have the subject show him the money taken from the locker. The experimenter will then give the subject an envelope to give to the examiner. Sealed in the envelope will be the subject's condition (innocent or guilty). The PDD examiner who's name was on the locker from which the subject stole the \$50, will later take the subject to a PDD testing lab. After the appropriate introductions, the examiner will take the envelope from the subject and place the envelope on the desk. Once in the testing lab, the subject will deny any knowledge or involvement in the theft of any of the examiner's money.

The subject will be admonished to cooperate fully with the examiner, as lack of cooperation may lead to inconclusive results. If the diagnosis of the guilty subject's PDD test is inconclusive due to non-cooperation, (s)he does not get to keep the \$50.

The subjects assigned to the innocent condition will be told that some money was taken from the examiner that day, but will be given no information regarding the scenario and will

not be allowed to interact with any of the guilty subjects. The innocent subjects will be informed that they will be given a PDD test regarding the taking of the money, but since they were not involved in any way, they will have no information or knowledge of the details of the crime (Appendix E). The innocent subjects will be separated from any programmed guilty subjects to avoid contamination.

All subjects will be informed that they will be given a PDD or CVSA test shortly regarding a theft investigation. Regardless of their programming, they will be instructed to cooperate fully with the examiner and if asked by an examiner about the case, to say that they had been informed by DoDPI staff that (s)he would be questioned about the taking of some money from an examiner, but they know nothing about it.

Each subject will be given an envelope to give to the examiner. Sealed in the envelope will be the condition of the subject (innocent or guilty). The subject will know that this information is in the envelope. The subjects then will be taken to a laboratory. After the appropriate introductions, the examiner will take the envelope from the subject and place the envelope on the desk where the subject can see it at all times. The examiner will then discuss the purpose of the examination and acquaint the subject with the test format.

Appendix E

Script for Scenario Setter

For "Guilty" Group

Today there will be a mock crime committed. The crime will be a theft and you will have the pleasure of perpetrating that crime against one of our examiners. In an effort to make the scenario meaningful to the examiner who will be giving you your test today, you will in fact be taking the examiner's money and then be given a PDD or CVSA test from that examiner to see if the examiner can catch you in the theft. The examiners are so convinced that they will be able to tell when somebody is lying to them, that they have agreed to put their "money where their mouth is." Each examiner has left \$50 of his own money in his wallet, in a wall locker marked with his name. The wall locker is locked with a key lock, which is itself in a locked room. Now here is the best part, if you take the money and the examiner cannot determine with the PDD or CVSA test that you have taken the money, then you get to keep the examiner's \$50. This is on top of the money you are already being paid to participate. If the examiner can determine that you did in fact take the money, then you must return the \$50 to the examiner. Remember, you will be taking the examiner's own money. Don't feel bad. These guys are so confident, they believe that nobody can beat them in this test. These examiners believe that nobody can fool them and they are convinced that they are not going to lose any of their money.

I will now give you a key ring with several keys on it. When I give you the word, you must find the correct key for the door to the locked room, open the door, then find the correct key for the locker and open it. You will then take the \$50 from a wallet left in the locker, place the money somewhere on your person, lock the locker and the room door, and then return to the waiting room in which I will be waiting. I will have you show me the money you took and I will give you an envelope to give to the examiner. Sealed in the envelope will be the your programming (innocent or guilty). The examiner who's name was on the locker from which you took the \$50, will later take you to a testing lab. After the appropriate introductions, the examiner will take the envelope from you and place the envelope on the desk. Once in the testing lab, you must deny any knowledge or involvement in the theft of any of the examiner's money. If the examiner can make you admit you took the money, then you do not get to keep the \$50.

Remember, you must cooperate fully with the examiner, as lack of cooperation may lead to inconclusive results. If the diagnosis of your test is inconclusive due to any lack of cooperation on your part, you do not get to keep the \$50. Remember, if asked by the examiner about the case, you will deny any involvement in the theft of any of the examiner's money. Simply tell the examiner that you were told some money had been taken and that you were going to take a test on it.

GOOD LUCK

Appendix F

Script for Scenario Setter

For "Innocent" Group

Today there was a mock crime committed. Somebody took some money that belonged to the examiner who will be giving you your PDD or CVSA test. Since you did not have any part in that crime, you obviously do not know any of the details of that crime. In a little while an examiner will be asking you to take a PDD or CVSA examination. I would like you to go with him and take the test. He may ask you what you know about the "Theft". Simply tell him the truth. Tell him that you were told that some money had been taken and that you are going to be tested on it. Remember, you had no involvement in the taking of the money. In every other way I would like you to be as cooperative as possible and do your best to follow all the examiner's instructions. If you are able to convince the examiner that you are innocent regarding the "theft", you will be given a \$50 bonus before you leave.

If you have any questions or feel uncomfortable about anything, tell the examiner that you would like to talk to me and I will do my best to assist. Thank you again for your assistance.

Appendix G

Polygraph Pre-Test Interview

Good morning (afternoon), my name is _____ and I will be conducting the polygraph examination today. I am a Forensic Psychophysiologicalist and like you I have been detailed to assist Dr. Cestaro in this very important research project. You and I know that this project is very important otherwise the Army would not have provided us to participate.

Before we begin conducting any examinations I will explain everything that will be attached to you for this examination and we will have discussed a little bit about your background and one of the theories of psychophysiological detection of deception. Let me assure you that nothing will be said or done here that will in any way hurt or injure you. Do you have any questions before we proceed?

Now, I would like to review the interview work sheet.
[Review Pre-Test Questionnaire - Appendix C]

One of the theories concerning the psychophysiological detection of deception or the ability of a trained forensic psychophysiologicalist (polygraph examiner) to diagnose deception is that of Fight or Flight which you may be familiar with from sports and your training in the military. This phenomenon is theorized to be what allows us to survive in dangerous or stressful situations. When the mind recognizes that we are in danger we enter into Fight or Flight and the naturally occurring substance epinephrine is released into the blood stream. Epinephrine effects different organs of the body in different ways. In the case of the cardiovascular system this substance causes the activity of the heart to increase along with a marked increase in the pulse, blood pressure, and other cardiac activity.

In the case of the heart the increases are to provide more oxygen and nutrients to the large muscles of the legs and arms so we can run away from the problem or fight our way out of the problem. Additionally this provides more oxygen to the brain so we can think our way out of the problem. The epinephrine additionally effects our lungs by causing them to increase activity to better place oxygen in the blood stream and to remove carbon dioxide from the system.

The body experiences numerous other physiological changes to include changes in the sweat gland activity and the electrodermal activity at the skin. Normally these reactions are associated with fear. These reactions are what allow us to survive in stressful situations such as combat, parachuting, and other duties.

[The Examinee is then asked to provide an example of when they might have experienced this phenomenon. Common examples were as follows: 1st traffic citation; traffic accidents.]

Well, I can tell by your example that you are familiar with these reactions. The same

type of reactions occur when we are practicing deception because there is a fear of being caught in an untruthful statement or being punished for the untruth. Have you ever experienced these reactions? (PAUSE FOR SUBJECT RESPONSE)

When you were growing up, if you are like most people, you were raised to know the difference between right and wrong. Quite probably, all of the adults you came in contact with --your parents, grandparents, relatives, teachers, church officials--taught you that lying, cheating, and stealing were wrong. Ever since you were a young child, you have been programmed to know that lying is wrong. Think about the first time you lied and you got caught. Remember how your body felt during that confrontation. Your heart may have been racing or you may have been sweating. However, the responses were automatic; your body adjusted to the stress of the situation.

People are not always 100% honest. Sometimes it is kinder and more socially acceptable to lie than to be honest - such as telling someone you like their clothes when you really think the clothes are awful. It is important for you to understand that even though a lie might be socially acceptable or only a small lie, or a lie by omission, your body still responds. The recording on the polygraph will show only the physiological responses. I cannot know what kind of lie you are telling. Therefore, it is extremely important that you be totally honest to all the questions I ask you about the taking of my money.

With the sensitive apparatus associated with a polygraph instrument a trained polygraph examiner can diagnose when an individual has been less than truthful when answering questions while attached to the instrument. The actual attachments that will be placed on your body are the standard hospital blood pressure cuff, to monitor your cardiac activity. Two small metal plates which will be attached to you finger tips to monitor your sweat gland activity, and two convoluted tubes which will be placed around your torso to monitor you respiratory activity.

Appendix H

Overview of the Procedures

"In an effort to find out who took my money, I will be administering a psychophysiological detection of deception examination. We commonly refer to it as a PDD exam. You may know it as a polygraph. The examination consists of several tests. I will explain all the questions on each test before I conduct the test. First, however, I need to obtain your consent to undergo this examination because I will not give you an examination without your consent."

"Before we continue, I would like to give you an idea of what we will be doing here today. I will explain the instrument and how it works and I will even demonstrate it to you. Then, I will discuss with you, the questions that I will be asking you on the test. Before each test, I will discuss the questions on that test. In this way, I will be sure that you understand the questions and you will not be surprised by any of the questions. Do you have any questions?"

Explanations of Instrumentation and PDD Theory

The next step is to explain the instrumentation and fight/flight/freeze to the subject, as shown in Appendix G.

Acquaintance test

A standard known solution numbers test will be the only acquaintance test utilized. The rationale for the acquaintance test will be presented as follows: "I now am going to demonstrate the physiological responses we have been discussing. This test is intended to give you the opportunity to become accustomed to the recording components and to give me the opportunity to adjust the instrument to you before proceeding to the actual test. In addition, this test will demonstrate to me that you are capable of responding and that your body reacts when you knowingly and willfully lie."

The standard four components (two pneumo tubes, electrodermal plates and cardio cuff) are attached at this time, followed by the acquaintance test. The acquaintance test will be conducted in the manner taught at DoDPI. The results will be discussed with the subject. Appendix K provides guidelines for this discussion.

Discussion of case facts

After the acquaintance test is completed, the examiner will go over the facts surrounding the taking of the money from the wallet which was left in the locker. The examiner will reinforce that the money taken was HIS money and that if the subject took it, then the results

of the test will prove this fact to the examiner. The examiner will then walk the subject through the crime. The examiner will ask the subject if he entered the room the money was left in, if the subject opened the locker, if the subject handled the wallet that was left in the locker, and finally, if the subject took the money out of the wallet, or handled the money in any way. The subject will be asked if he watched somebody else take the money, if he acted as a lookout for someone else, or if he participated in any way in taking any of the money from the examiner. Once the subject has assured the examiner that he was not involved in taking any of the money, then the examination will proceed with the question review.

Question review

Subject remains in exam chair with components attached during the question review. Explanation to subject: "I am going to review the questions that I will be asking you during the examination. There are three types of questions; questions about the money and two types of diagnostic questions. I will explain each type of question and I will review each question in detail. It is very important that you pay attention and follow carefully, my directions. The first questions will be the questions about the money."

Review sacrifice relevant

Regarding the taking of my money, do you intend to answer each question truthfully?

Pretest relevant

R1 - Did you take any of my money?

"What I mean is; Did you take any of my money? I do not care if you took the entire \$50, or any part of it, no matter how small. If you actually removed any part of my money from that wallet, then you will know that when you answer this question. If you did not take any of my money, then you will have no problems answering this question. So once again; Did you take any of my money?"

R2 - Did you open that locker door?

"The locker I am talking about, is the locker that contained the wallet that had my \$50. If you took any part of my \$50, you would have had to open that locker door to get to the wallet that contained my \$50. If you did not touch that locker door, then you will have no problems answering this question. So once again: Did you open that locker door?"

The examiner will be sensitive to and clear up any misconceptions about the meaning of the questions and will draw out any concerns the subject might have regarding anything which comes to mind when each question is asked.

Rationale for directed lies

"I will now discuss the second type of question, the diagnostic questions. As I explained earlier, when you lie your body responds and I will be able to see it; just as it did during the demonstration test. If, however, you were given a test and I saw no responses to any of the questions it would look like you were telling the truth. For various reasons (sick, tired, using some medication) some people lose their capability to respond. Consequently, I must ask some questions that demonstrate you continue to have the capability to respond when you are lying and that you do not respond when you are telling the truth.

First I will review those questions used to determine if you are capable of responding when you lie. I already know the answer to these questions because we all have done these things at one time or another. When I ask the question I want you to think of an occasion when you did this--don't tell me about it, just think of a specific time. Then lie to me and say NO."

Review directed lies

The examiner will preface each DLC review with--"we have all (e.g. violated traffic laws)--you have, haven't you (they should answer yes)--of course. Now think of a specific incident (don't tell me). When I ask you 'Did you ever violate a traffic law' I want you to lie to me and say NO. When I ask you this question on the test--I want you to think of that incident when you lie to me."

The examiner will review two directed lie control questions from the list in Appendix I. (S)he will not give any examples of what (s)he means or what would be included in the directed lie question. If there is any resistance to a DLC (e.g., subject claims never to have engaged in the activity) the examiner will not use it; (s)he will select another DLC.

Rationale and review of irrelevant questions

"The final diagnostic questions you may hear are ones you will answer truthfully so that I can see how you are responding when you tell the truth. It will be obvious that you are telling the truth. The questions are...." The examiner will review two irrelevant questions from the list in Appendix J.

The examiner will then re-review all questions and have the subject answer as (s)he would during the phase II. Questions should be reviewed in the following sequence: SR, R1, R2, C1, C2, I1, I2. If the subject answers a DLC incorrectly, the examiner will remind the subject to think of the specific incident and to answer as instructed.

The examiner then will inform the subject that (s)he will be hearing some or all of the questions, that they will occur in no specific order, that some of the questions will be repeated and that they should sit still and follow directions. The subject will be reminded that they should think about the questions to which they are going to lie.

Question sequence

I1 I2 SR 1C1 1R1 1R2 1C2 2R1 2R2 2C1 3R1 3R2 2C2

Notations

Stim marks will be utilized as taught by the DoDPI. The questions will be notated utilizing the notation above. The first relevant is notated R1, the second control is notated C2, etc. The test ID will be identified in the upper left hand corner. The notation would be I-1 or I-2 (the test was conducted a second time due to INC decision).

Question spacing will be a window around 25 seconds. Additional irrelevant questions may be inserted only for the purposes of allowing physiological responses to return to baseline (obtaining purity). Only one irrelevant may be inserted in succession.

The test is run once. If the data associated with a relevant question is distorted or unusable due to movement, examiner error, etc. the examiner will add a fourth question sequence to the end of the test. To do this, (s)he simply asks both relevants again and ends with C1.

Though only one relevant response was distorted, both relevants will be asked. If a control question is distorted, the question is not repeated, since no additional relevant responses are required.

If a fourth question sequence is conducted, only the relevant question that was distorted will be evaluated and it will be inserted on the test score sheet at the location where the undistorted relevant score would have gone.

If a subject answers "yes" to DLC question 1C1 or 1C2 the examiner should go out of operation and discuss the testing procedure with the subject to insure (s)he understands the procedure. The subject will be reminded that (s)he should "lie" and answer "no" to the diagnostic questions. If the subject answers "yes" to any of the other DLC's during data collection, (s)he will be given an answering instruction, but the question is not repeated. That DLC question may not be used for scoring.

Numerical Evaluation

Test evaluation will use the standard 7-point scoring system and will utilize only the scoring criteria taught at DoDPI. Each relevant will be scored to the stronger of the two controls which bracket it. The strongest control is determined independently for each component. Each of the three question sequences will be scored for each of the two relevant questions. If a distortion occurred and a fourth sequence was conducted, the fourth sequence will be utilized only for the distorted question(s).

A question score will be calculated by adding the three sequence scores for that question.

The total score will be the sum of the two question scores.

If either of the question scores is less than or equal to a minus -3, (-4, -7, etc.) then the decision is DI, or if the total score is less than or equal to a minus -4 (-5, -10, etc.) the decision is DI. If the total score is greater than or equal to a plus +4 and both question scores are greater than zero, then the decision is NDI. If no decision is possible then the first sequence of the two relevant will be re-scored. For the re-score, the first sequences will be scored against the second control (1C2) only. The first control will be ignored. The question scores will be recalculated by adding the second sequence, third sequence and the re-scored first sequence. The decision criteria then will be applied to the new values. At this point, if neither an DI nor a NDI decision is possible, then the decision is inconclusive.

NOTE: The decision (DI, NDI, INC) is to the entire test, not to a specific question.

Subsequent to the operational phase of this study, additional numerical cutoffs will be applied to determine if different cutoffs would increase/decrease accuracy.

Upon completion of the evaluation of the test data, the examiner will conduct a post-test interview. The length and nature of the interview will be determined by the results of the test.

NDI/DI Decision: If, following the evaluation of the test, the decision is NDI or DI, then that test is complete. The examiner will inform the subject of his diagnosis. The examiner will then open the envelope in front of the subject. If the examiner correctly identified the subject as NDI (true negative), or obtains a false positive, then the test is finished and the subject is returned to the experimenter. If the examiner obtains a true positive, then he will request the subject return the \$50. If the examiner obtains a false negative, then the subject is told that he has successfully convinced the examiner that he was innocent, even though he was in fact guilty, and will be allowed to keep the \$50.

NOTE: If the subject should try to return the money, the subject is reassured that his keeping the money is part of the research, and that the examiner is not allowed to accept any money from the subject.

INC Decision: If, following the evaluation of the test data, a conclusive decision cannot be rendered, then a second series will be administered. Question R1 will be changed to R3, which will read;

R3-"Did you physically handle any of my money?"

"By physically handling my money, I mean that if you took any of my money out of that wallet, if you touched that money in any way. If you concealed it anywhere on your person, or if you took it and put it someplace else, then you did in fact physically handle my money. If you did none of these things, then you will have no problem with this question. So I ask you again; Did you physically handle any of my money?"

Question R2 will be changed to R4, which will read;

R4 - Have you deliberately lied regarding the taking of my money?

"What I mean is have you deliberately lied about taking my money out of that locker? Did you take any of that money? Did you go into the locker that contained my money? Did you handle the wallet that contained my money? Were you involved in any of the planning to take any of my money? If you did any of these things, then you will know that when you answer this question, you have deliberately lied about the taking of my money. If you have not lied about taking any of my money, then you will have no problems answering this question. So once again: Have you deliberately lied regarding the taking of my money?"

The examiner will also change any control questions that may be failing to produce physiological responses. The subject will also be reminded to think of, or visualize the incident related to the DLC question before they answer. If the results of the next test are also inconclusive, then the testing will be terminated and a "no opinion" result will be recorded.

All subjects will undergo a debriefing before release (See Appendix N).

A complete DLSI operational instruction guide containing the material discussed, will be issued to all examiners involved in data collection (see Appendix K).

Appendix I

Polygraph and CVSA Control Questions

The following are the only acceptable directed lies.

Did you ever violate a traffic (fishing, hunting, boating) law?

Did you ever say something derogatory about another person behind their back?

Did you ever do anything that made a family member (parent/spouse) mad at you?

Did you ever say something that you later regretted?

Did you ever lie to a previous supervisor about anything?

Did you ever lie to a co-worker about anything at all?

Did you ever say anything in anger that you later regretted?

Did you ever brag about yourself to impress others?

Appendix J

Polygraph and CVSA Irrelevant Questions

The following are the only acceptable irrelevant questions.

Are you now in (state)?

Is today _____?

Are you sitting down?

Are you now on (location)?

Are you sometimes called _____?

Appendix K

DLSI Test Outline

The following MUST be contained in each examination and will be presented in the order indicated:

INTRODUCTION

- Who you are (Name/Forensic Psychophysiologicalist)
- Purpose of the examination (To resolve whether or not the subject was involved in the theft case you are investigating).
- Have to mention Psychophysiological Detection of Deception (PDD)
- Examination consists of multiple tests

CONSENT-(Do rights advisement)

- Review consent form with subject
- Indicate any recording or observation devices
- Check that subject and witness signed consent form

OVERVIEW OF PROCEDURES - MUST mention the following:

- Will be reviewing background and medical question to assess suitability for PDD examination
- Will be explaining instrument and how the procedure works
- Will be conducting acquaintance test
- Will be discussing questions prior to each test

INVESTIGATION and DIAGNOSTIC QUESTIONS

BACKGROUND-MEDICAL--ESTABLISH RAPPORT

- Check completed form for biographical/medical information
- May ask about hobbies/interests (optional for rapport)
- Ensure that DLC areas are "touched upon"
- CANNOT DISCUSS ANY PERSONAL or LIFESTYLE QUESTIONS.

INSTRUMENT AND F3--follow this logic flow:

- DO NOT GET TOO TECHNICAL
1. Diagnostic tool--records physiological activity specifically
--respiration, sweat gland activity and heart activity (cardiovascular activity)

2. Show the components

- Explain briefly and nontechnically
- what they record (breathing, sweat activity & heart activity)
- Where they will be placed on the subject
- Mention cardio cuff will be inflated during test

3. Explain components record physiological data -

- autonomic nervous system/automatic response system -
- subject has no control over
- Give one F3 example--SHORT and SIMPLE
- These physiological changes are the same ones the instrument is recording

4. Same type of changes occur when we are dishonest, lie, mislead

- We are raised to know right from wrong
- lying is wrong (BRIEF)
- Think about a time when caught lying
- remember body responses were automatic
- People not 100% honest
- socially acceptable (little white) lies
- but body responds
- instrument only records responses
- cannot tell the difference between types of lies
- THEREFORE, NEED TO BE 100% HONEST to questions

5. We will demonstrate how this works

ACQUAINTANCE TEST

1. Give rationale for test

- Opportunity for subject to become accustomed to procedures and components
- Allows examiner to adjust instrument to subject
- Demonstrate to the examiner that subject is "CAPABLE OF RESPONDING WHEN S/HE LIES" and what it looks like when they tell the truth

2. DO NOT SAY IT SHOWS WHAT IT LOOKS LIKE WHEN YOU LIE

3. Explain how the test works--set up test

4. Conduct test - KNOWN SOLUTION NUMBERS TEST ONLY

5. Present results of test (reenforce what happens when subject lies)

DISCUSSION OF CASE FACTS

1. Did subject go into the room where the money was stolen?
2. Did the subject open the locker where the wallet was kept?

3. Did the subject handle the examiner's wallet in any way?
4. Did the subject see the examiner's money?
5. Did the subject remove any of the examiner's money from the wallet?
6. Did the subject take any of the examiner's money out of the room?
7. Did the subject see anybody else take the money?
8. Did the subject act as a lookout, or help somebody else take any of the money?

QUESTION REVIEW - leave components attached to subject

1. Explain that you will be reviewing questions next
2. Mention different types of questions
 - a. Investigation questions
 - b. TWO different types of DIAGNOSTIC questions
 1. Questions that subject will lie to ensure that they continue to have the capability to respond when they lie
 2. Questions that subject will answer truthfully to see what it looks like when they tell the truth
3. Indicate that it is important they follow directions
4. Give rationale for sacrifice relevant question
5. Review sacrifice relevant question
6. Give lead-in for relevant question review, i.e., if anything comes to mind when I ask the relevant questions, if you're not sure you should mention something, you need to mention it.

7. R1 - DID YOU TAKE ANY OF MY MONEY?:

- a. Review R1--ask subject what it means to them
- b. Give definition:
 1. Review question as it is on the test and get subject's answer

8. R2 - DID YOU OPEN THAT LOCKER DOOR?:

- a. Review R2--ask subject what it means to them
- b. Give definition:
- c. Review question as it is on the test and get subject to answer it

9. DIAGNOSTIC QUESTIONS:

a. Give rationale

1. Acquaintance test demonstrated that when you lie you respond
2. Some times over time people lose the capability to respond (fatigue, etc.)
3. To be an accurate test, I need to make sure you maintain the "CAPABILITY TO RESPOND WHEN YOU LIE".
4. I'm going to ask some questions to ensure you retain this capability
5. DO DLC's:
 - a. "I'm going to ask questions that I already know the answer to--we all have done these things at one time or another".
 - b. Ask first DLC--get verbal commitment they admit to act.
 - c. Ask subject to think of a specific incident--tell them "don't tell me what it is now as I don't want to know--just think of it--GET COMMITMENT THEY HAVE A SPECIFIC INCIDENT IN MIND".
 - d. "Okay - now when I ask you that question I want you to think of that incident and lie to me"--ask question--get lie.
 - e. Tell them that when you ask that question on the test, you want them to think of that incident and then lie to you about it.
 - f. Review DLC--ensuring that subject pauses shortly before answering the question--IF NOT, DO IT AGAIN.
 - g. Do the second DLC in the same way - set it up, get verbal commitment to act and to having specific incident in mind without telling you about it. Tell them to think about the incident when you ask them the question on the test. Review question and get subject to answer it as they will on the test.

6. **Rationale for Irrelevant**

- a. Asking questions both know the truth to.
- b. Need to see what it looks like when being truthful.
- c. review irrelevant and document subject's answers.

7. **Re-review questions in this order:**

SR, R1, R2, C1, C2, I1, I2 (get verbal responses ensuring subject answers DLCs properly).

10. **PREPARE SUBJECT FOR THE TEST:**

- a. Will be asking questions in different order.
- b. Format requires some questions to be asked several times .
- c. Sit still, look ahead, no moving, etc. (same procedures as acquaintance test).

11. **CONDUCT THE TEST, ANALYZE TEST.**

12. **IF THE SUBJECT IS NDI/DI:**

If, following the evaluation of the test, the decision is NDI or DI, then that test is complete. The examiner will inform the subject of his diagnosis. The examiner will then open the envelope in front of the subject. If the examiner correctly identified the subject as NDI (true negative), or obtains a false positive, then the test is complete and the subject is returned to the experimenter. If the examiner obtains a true positive, then he will request the subject return the \$50. If the examiner obtains a false negative, then the subject is told that he has successfully convinced the examiner that he was innocent, even though he was in fact guilty, and will be allowed to keep the \$50.

NOTE: If the subject should try to return the money, the subject is reassured that his keeping the money is part of the research, and that the examiner is not allowed to accept any money from the subject.

13. IF TEST IS INCONCLUSIVE

If following the evaluation of the test data, a conclusive decision cannot be rendered, then a second series will be administered. Question R1 will be changed to R3, which will read:

R3 - "Did you physically handle any of my money?"

Question R2 will be changed to R4, which will read;

R4 - "Have you deliberately lied regarding the taking of my money?"

The examiner will also change any control questions that may be failing to produce physiological responses. The subject will then be told:

- a. We will continue on with additional testing
- b. Next test will have same types of questions--INVESTIGATIVE & DIAGNOSTIC (DLCs and truth)
- c. Must be 100% honest on investigative questions
- d. DLCs are there to ensure subject has continuing capability to respond when they lie--tell them if same or different diagnostic questions will be used. The subject will also be reminded to think of, or visualize the incident related to the question before they answer.

14. If the results of the next test are also inconclusive, then the testing will be terminated and a "no opinion" result will be recorded NOTE: The subject will not get to keep the \$50 in the case of purposeful non-cooperation.

Appendix L

CVSA Pre-Test Interview

Good morning (afternoon), my name is _____ and I will be conducting the computer voice stress examination today. I have been trained and certified in the use of the Computer Voice Stress Analyzer and have been detailed to assist in this very important research project. You and I know that this project is very important otherwise the Army would not have provided us to participate.

Before we begin conducting any examinations we will have discussed a little bit about your background and one of the theories of psychophysiological detection of deception. Let me assure you that nothing will be said or done here that will in any way hurt or injure you. Do you have any questions before we proceed?

Now, I would like to review the interview work sheet.
[Review Pre-Test Questionnaire - Appendix C]

One of the theories concerning the psychophysiological detection of deception or the ability of a trained forensic psychophysiological (polygraph examiner) to diagnose deception is that of Fight or Flight which you may be familiar with from sports and your training in the military. This phenomenon is theorized to be what allows us to survive in dangerous or stressful situations. When the mind recognizes that we are in danger we enter into Fight or Flight and the naturally occurring substance epinephrine is released into the blood stream. Epinephrine effects different organs of the body in different ways.

The body experiences numerous physiological changes to include changes heart rate, in the sweat gland activity and the electrodermal activity at the skin. Normally these reactions are associated with fear. These reactions are what allows us to survive in stressful situations such as combat, parachuting, and other duties by providing the brain and certain muscles with additional blood and oxygen, and by removing carbon dioxide from the system.

[The Examinee is then asked to provide an example of when they might have experienced this phenomenon. Common examples were as follows: first traffic citation; traffic accidents.]

Well, I can tell by your example that you are familiar with these reactions. The same type of reactions occur when we are practicing deception because there is a fear of being caught in an untruthful statement or being punished for the untruth. Have you ever experienced these reactions?

It is also believed that this Fight or Flight response can affect certain aspects of our speech patterns that cannot be detected by the unaided ear. Special equipment has been designed and built that is able to detect and analyze those patterns. Today we will use an instrument designed for this purpose to determine whether you are being less than truthful during a voice

stress examination.

Review questions to be asked on examination (Appendix M) with the subject.

Appendix M

CVSA Questions (ZOC)

- IR 1. Are you now in (state)?
- C 2. Control question from list in Appendix I *
- IR 3. Are you sometimes called _____?
- R 4. Did you open that locker door?
- IR 5. Is today (day of week)?
- R 6. Did you take any of my money?
- IR 7. Are you now at/on (location)?
- C 8. Control question from list in Appendix I *
- IR 9. Are you sitting down?

* Subjects are instructed to answer untruthfully to the control questions.

Appendix N

Participant Debriefing Statement

Now that you have completed your role in our research, it is the desire of the entire project staff to take this opportunity to sincerely thank you for your help. Your work here may be more important than you realize.

If you participated in deceiving the PDD or CVSA examiner, you are assured by the staff of this institute, that you in no way violated any rule or law. The deception was required for investigational purposes only.

For those of you who actually committed a mock crime today, you are assured by the staff of DoDPI, that you in no way violated any rule or law. The mock crime was just that, pretend. However, those who did take the money were really lying to the examiner.

For those of you who committed no mock crime, your role was just as important, as no polygraph or voice stress analysis procedure is useful if it cannot identify the innocent as well as the guilty.

Regardless of your role, it is our hope that nobody involved in this study has made you uncomfortable in any way. If you do have questions or concerns please bring them to the attention of your briefer or to Dr. William Yankee, our institute Director. Regardless of the role you played, it is our hope that you were made to feel as comfortable as possible throughout the study. If you do have concerns or questions regarding your participation, please make them known to the principal investigator, Dr. Victor Cestaro, and / or the DoD Polygraph Institute Director, Dr. William Yankee [Telephone number: (205) 848-3803].

Finally, it is VERY IMPORTANT that you DO NOT discuss the details of this study with anyone else. One of your friends, or a friend of a friend, may decide to participate in this or a similar study someday. If they know the details of the investigation process, they could be disqualified from participating in a study and/or unconsciously influence the results of the study using their GUILTY KNOWLEDGE. Please sign this form in the space provided to indicate that you understand the instructions provided above.

Participant Signature

Printed Name

Date